Report on RAP and HRRR verification including:

1) Winds – RAP OPER and HRRR OPER by quarter (vert. profile)
2) Relative humidity – RAP and HRRR by quarter (vert. profile)
3) Clouds -- RAP and HRRR by quarter (time series w/ 90 day avg.)
4) Reflectivity – RAP and HRRR by quarter (lead time)

NOTES:

1. RAP OPER (v2) and HRRR OPER (v1) were completely frozen during the period 1 April 2015 – 31 March 2016, so all quarterly differences in verification scores due to seasonal differences in the weather and associated forecast challenges.

2. RAP GSD (v3) and HRRR GSD (v2) were fairly constant for most of the year, but some enhancements, so seasonal comparisons do not solely reflect weather differences).

3. There are some breaks in the verification record which affect the results for all plots (OPER and GSD). For images showing the vertical profile or lead-time dependence of errors for different seasons on one plot, the "unmatched" setting must be used (stats not event matched), so differences in the completeness of the verification time series will not be readily apparent. Even when an error time series is shown (ceiling), gaps will be masked by the averaging (90-day averaging used here).

4. For reflectivity lead time plots, HRRR OPER (v1) is frozen code, but HRRR GSD (v2) improved, and had forecast length extended to 24-h starting summer 2015(but it will only be run to 18-h when implemented as HRRRv2 at NCEP).

SUMMARY OF RESULTS:

As expected, maximum wind errors aloft are during winter months, minimum during summer. Maximum relative humidity errors during spring and summer. Maximum ceiling/cloud forecasting skill during winter (large-scale systems), least skill summer.   For convection (reflectivity), HRRRv2 has similar CSI score to HRRRv1with much better bias (reduced over prediction). Also improve radar data assimilation resulting in better HRRRv2 CSI for 1-4 h lead-time. Reflectivity skill is lowest in summer (forecasts of small-scale storms are most challenging).
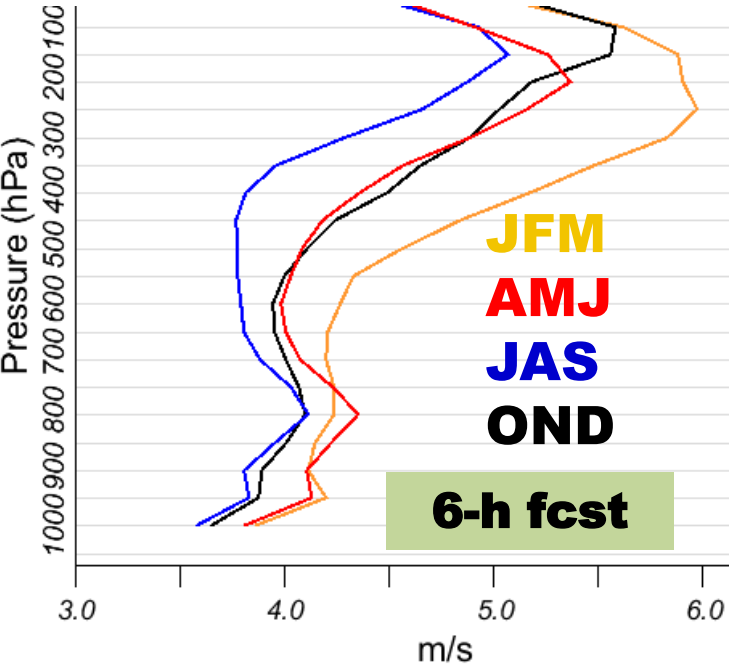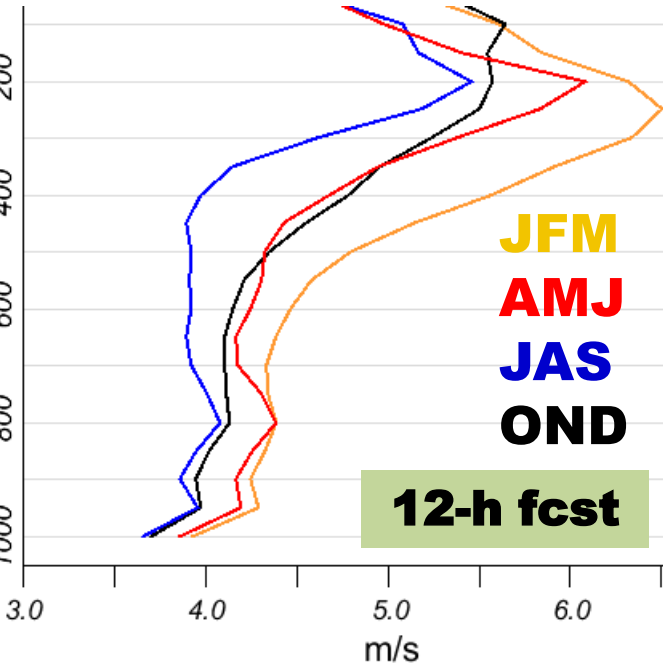
NCEP oper RAP (RAP v2) — Winds RMS Error (vs. raob)

6-h fcst / 12-h fcst, seasons JFM, AMJ, JAS, OND
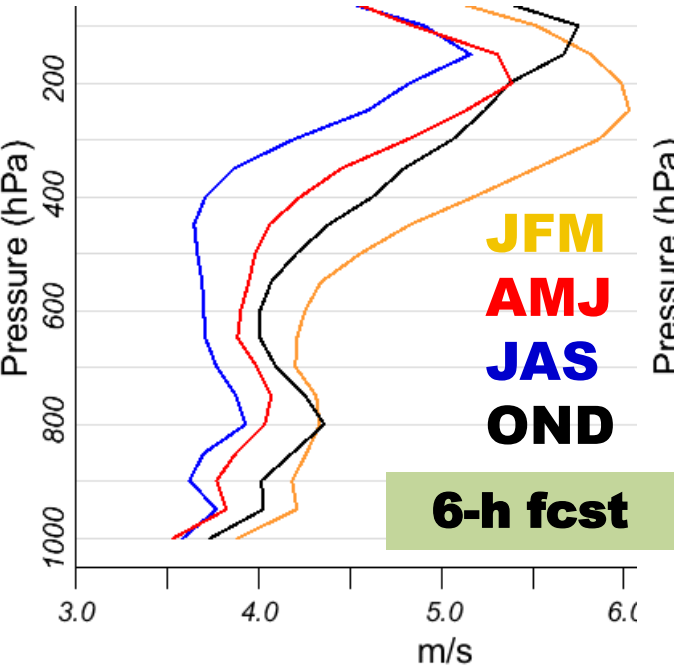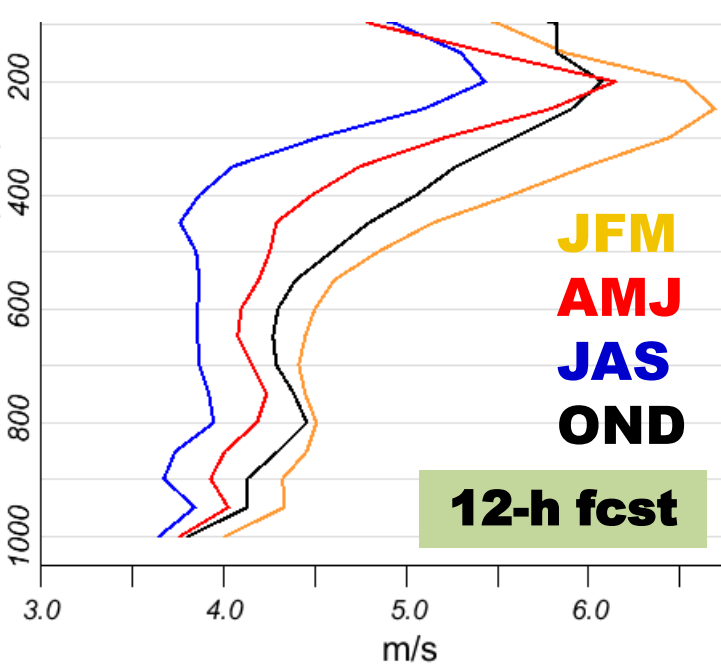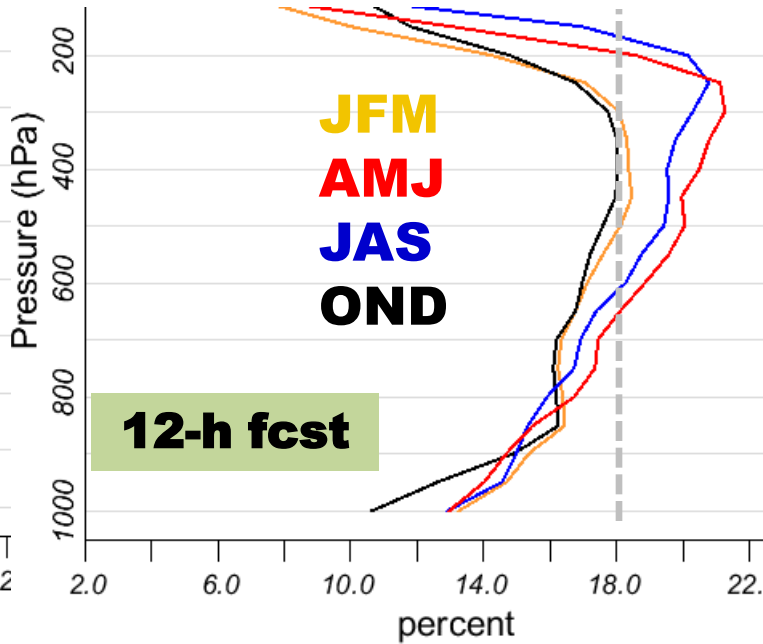
NCEP oper HRRR (HRRR v1) — Winds RMS Error (vs. raob)

6-h fcst / 12-h fcst, seasons JFM, AMJ, JAS, OND

NCEP oper RAP (RAP v2)

Relative Humidity RMS Error (vs. raob)

JFM
AMJ
JAS
OND

6-h fcst

12-h fcst
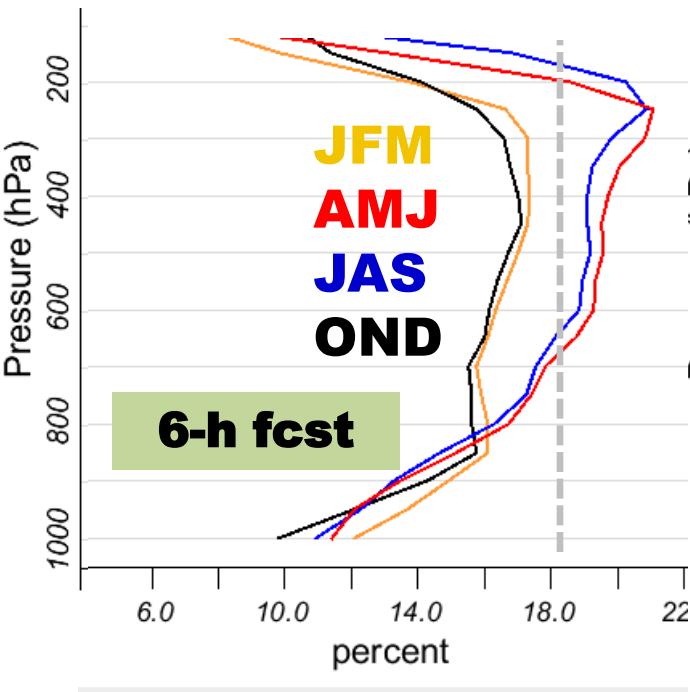
NCEP oper HRRR (HRRR v1)

Relative Humidity RMS Error (vs. raob)

JFM
AMJ
JAS
OND

6-h fcst

12-h fcst
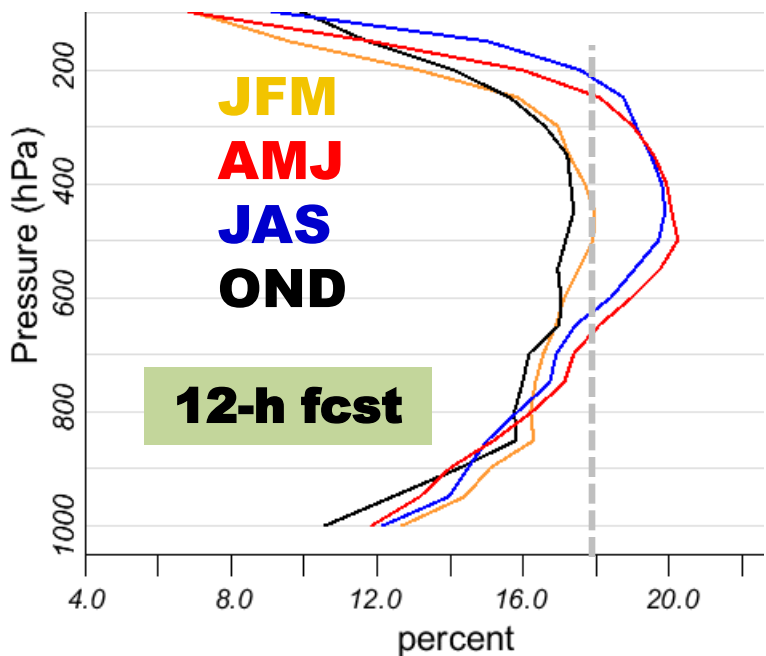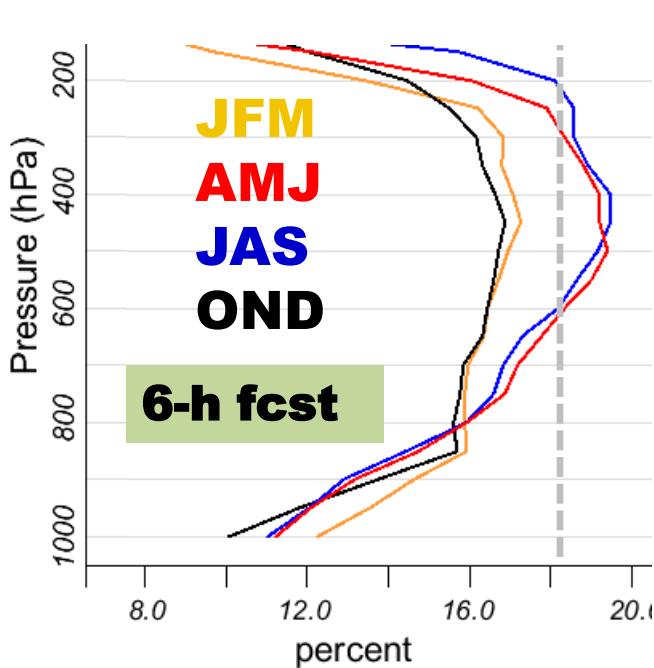
GSD RAP
(RAP v3)

Clouds
Ceiling True Skill Score
(90 day average)

3000' ceiling
1000' ceiling
any cloud
500' ceiling

(x 100)

65
55
45
35

6-h fcst

Jun   Aug   Oct   Dec

AMJ   JAS   OND   JFM

GSD HRRR
(HRRR v2)

3000' ceiling
1000' ceiling
any cloud
500' ceiling

(x 100)

65
55
45
35

6-h fcst

Jun   Aug   Oct   Dec
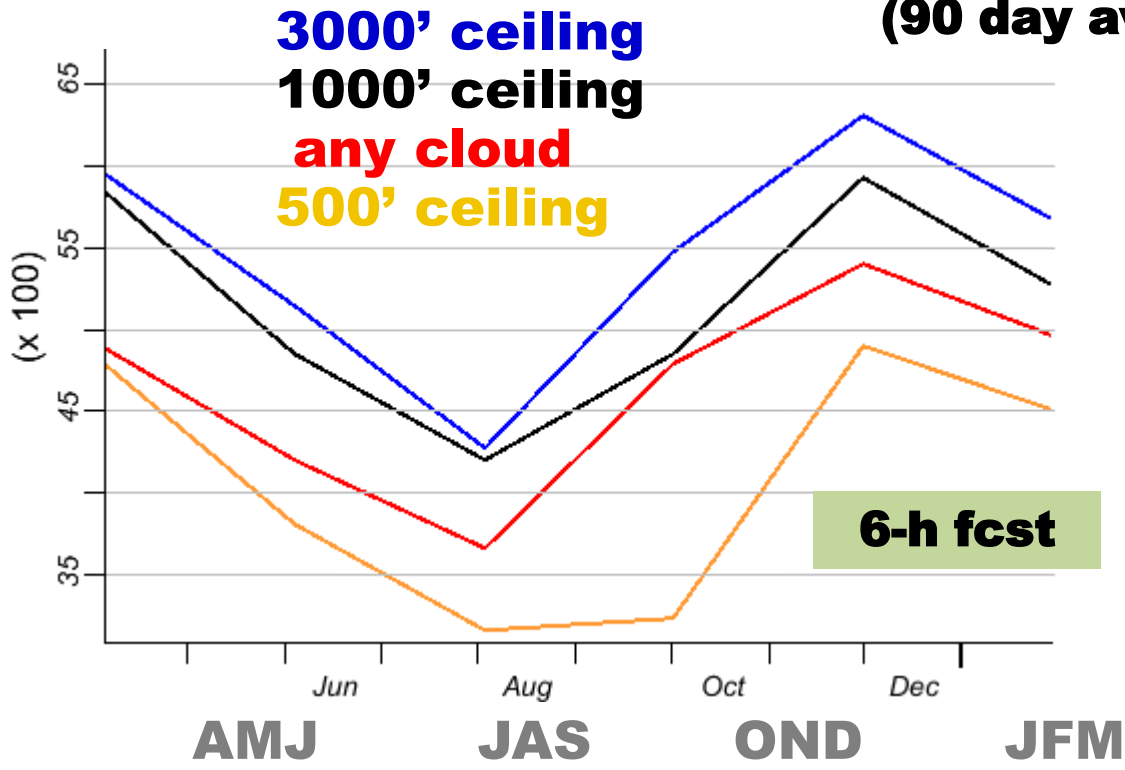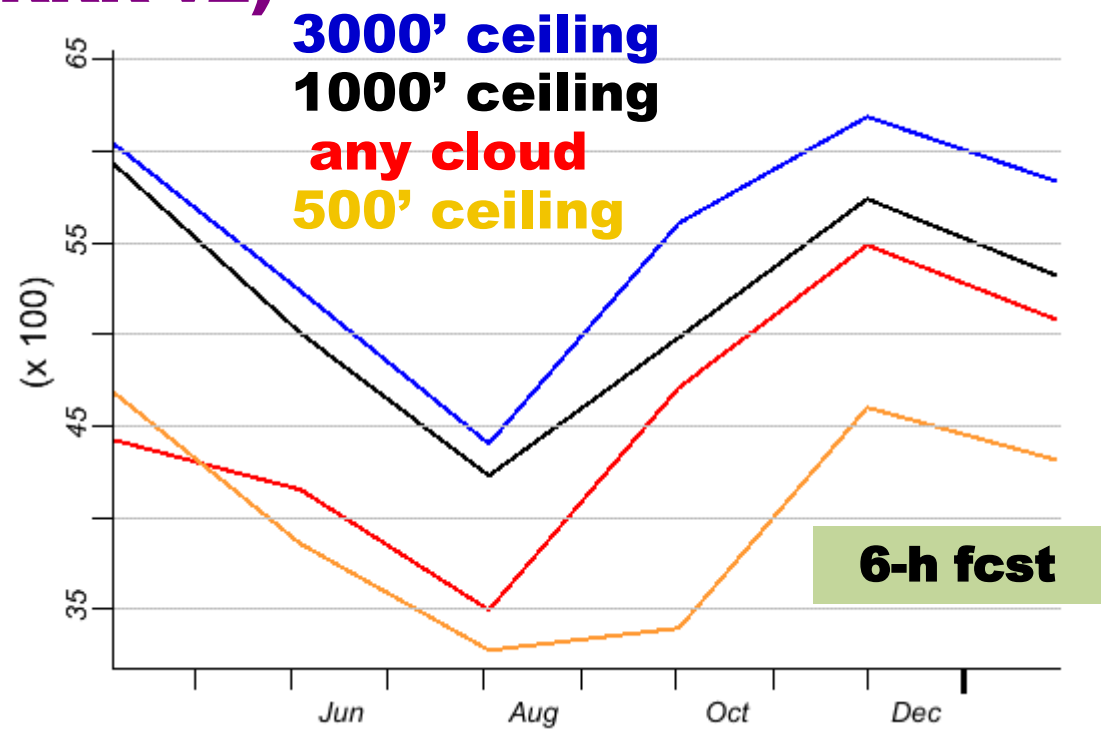
NCEP oper HRRR (HRRR v1)
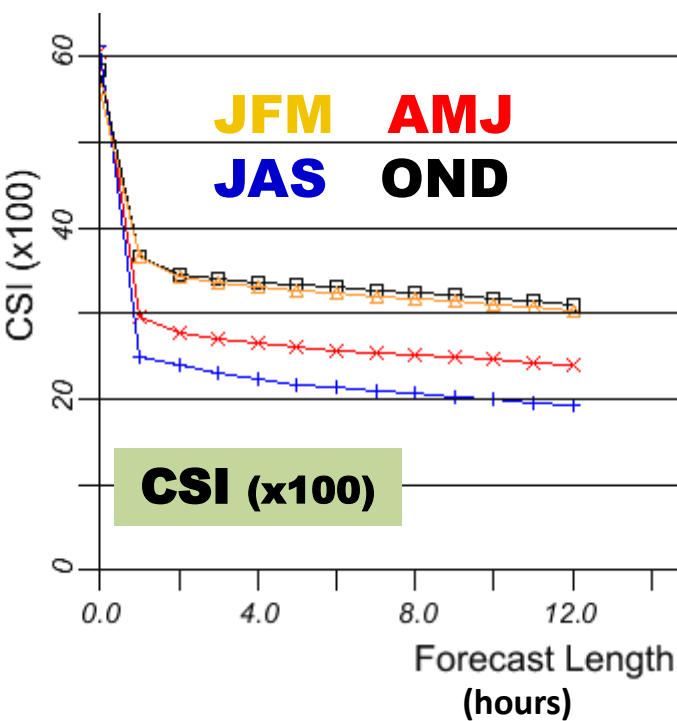
Convective forecast accuracy (CSI and bias)
(20 dbz, 20-km, E. US)

JFM   AMJ
JAS   OND

CSI (x100)

JFM   AMJ
JAS   OND

1.0

bias (x100)

GSD HRRR (HRRR v2)

1.0

bias (x100)

JFM   AMJ
JAS   OND

CSI (x100)

JFM   AMJ
JAS   OND